FUNCTIONAL SERVICING REPORT

3503 BYNG ROAD

WINDSOR, ONTARIO

PROJECT NO: 24-065

DATED: MAY 8, 2025

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1. INTRODUCTION

Baird AE was retained to prepare a functional servicing report for the proposed development located on southwest corner of Lappan Avenue and Byng Road in Windsor, Ontario. This report addresses stormwater management quantity and quality control, along with storm, sanitary and water connection requirements to accommodate the construction of a new development containing a 6-unit residential apartment, parking area & landscape open space area.

This report and the associated design are prepared in accordance with the Windsor-Essex Regional Stormwater Management Standards Manual (WERSTM) and the development manual published by the Corporation of the City of Windsor to ensure compliance with local design standards and development regulations. Moreover, it outlines sediment and erosion control measures.

2. EXISTING CONDITIONS

The proposed site is located at the southwest corner of Lappan Avenue and Byng Road in Windsor, Ontario. Current condition of site includes detached residential lot, driveway and landscape open space area, as can be seen in *Figure 1* provided below. According to the soil type mapping tool provided by the Essex Region Conservation Authority (ERCA), the underlying soil type for this site is Brookstone Clay, which belongs to hydrologic soil class D, as per the WERSTM. The existing condition of the site, as depicted in *Figure 1*, was deemed to be “good condition” and thus the run-off co-efficient applied in the pre-development analysis was selected as C=0.47 to reflect that condition.

Figure 1: Pre-Development Condition

2.1 Storm Sewer

- Existing site has storm tie in connection into storm sewer located in Byng Road.
- Existing 975 mm Ø storm sewer is located in Byng Road R.O.W.

2.2 Sanitary Sewer

- Existing 250 mm Ø Sanitary sewer is located in Byng Road R.O.W.
- Existing 375 mm Ø Sanitary sewer is located in Lappan Avenue R.O.W.

2.3 Watermain

- Existing 200mm watermain is located in Byng Road R.O.W.
- Existing fire hydrants are located on northeast corner of Lappan Avenue and Byng Road.

3. PROPOSED CONDITION

As shown on the Site plan in *Figure 2*, the site will consist of a 6-unit residential apartment, parking area & landscape open space area.

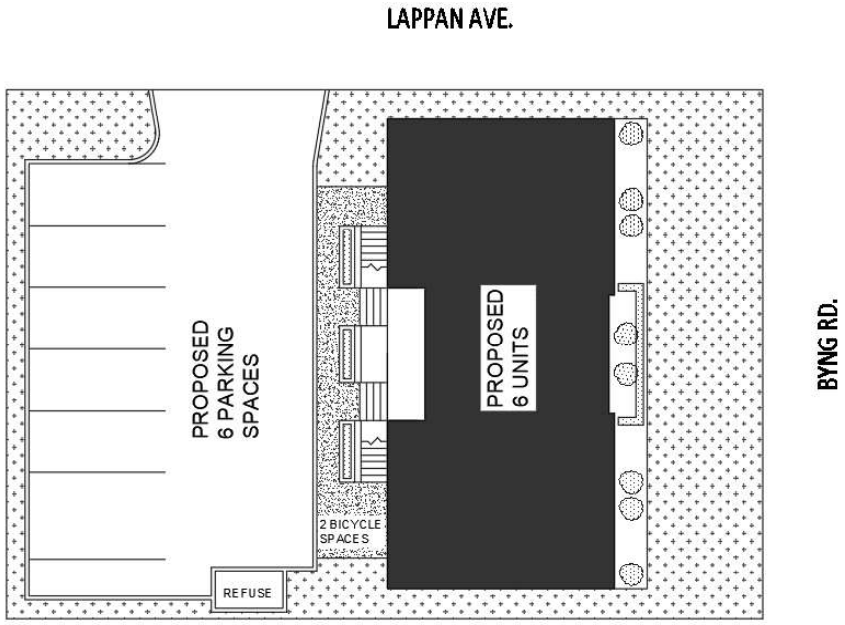

Figure 2: Post-Development Condition

3.1 Storm Sewer and Stormwater Management

The storm servicing and stormwater management criteria for this development are based on the requirements of the City of Windsor and ERCA. The findings are summarized below, and detailed calculations are provided in *Appendix A.*

It has been determined that the post-development peak flow for all storm events from the development will be stored on site and run off will be released with 5-year pre-development release rate into the existing 975 mm Ø storm sewer located on Byng Road R.O.W.

Proposed development has soil Classification of Brookstone Clay (Hydrological Group D) as per ERCA GIS Mapping. Soil infiltration was accounted for in our analysis using the Horton Infiltration Method. The Horton infiltration parameters used, as prescribed by the WERSWM, are provided in *Table 1*.

Table 1: Infiltration Parameters

Attribute		Brookston Clay Hydro Group (D)
Horton's Infiltration	Max. Infil. Rate (normal) (mm/hr)	25
	Min. Infil. Rate (mm/hr)	0.5
	Decay constant (1/hr)	4.0
	Drying Time (days)	7.0

Table 2: Pre-Development Condition

Surface	Area	Run-off
Hard Surface (Existing House & Driveway)	248	0.90
Grass Area	407	0.20
Total	655	0.47

Storm events that are applied to proposed development Hydrograph modelling are outlined below in *Table 3*. These models were used to determine vulnerable points and assess conformity to municipal standards.

Table 3: Rainfall intensities used for Hydrograph Modelling

Storm Event	Storm Duration	Rainfall Depth
2-year SCS Type-II Storm	24 Hours	53.40 mm
5-year SCS Type-II Storm	24 Hours	68.00 mm
100-year SCS Type-II Storm	24 Hours	108.00 mm
Urban Stress Test	24 Hours	150.00 mm

As per pre-development 2 and 5-year release rate, site will be allowed to release up to 6 L/s and 7 L/s.

The proposed development consists of a multi-storey 6-units residential building, parking area & landscape open space area. The post-development analysis of the site was completed using the SCS method and the Hydraflow Hydrographs Extension in Autodesk Civil 3D. Based on the proposed development layout, as shown in the drawings included in Appendix A, the post-development curve number (CN) for the development was assumed to be 84.

During the minor storm event, the flow will be conveyed by storm sewers. Major storm events, such as 100-year storm event and Urban Stress Test, will be managed by surface storage and backyard swales. To maintain allowable release rate, a proposed 150 mm Ø storm service connection will tie-in to existing 975 mm Ø storm sewer and allowable to release up to 5 L/s during the major storm event.

According to the SCS II 24-hour post-development analysis of the site, as provided in Appendix B, the restricted flows for the site shall be as provided in Table 4 below.

Table 4: Post-Development Flows

Storm Return Period	Un-Restricted Flows (m3/s)	Restricted Flows (m3/s)
2-year	0.005	0.002
5-year	0.008	0.003
100-year	0.016	0.005
UST	0.025	0.007

3.2 Sanitary Sewer

The proposed development will outlet into an existing 250 mm Ø sanitary sewer located in Byng Road R.O.W. with 150 mm Ø sanitary service connection.

3.3 Watermain

The proposed development will tie-in existing 200 mm Ø watermain located in Byng Road R.O.W. with 50 mm Ø water connection.

4. WATER QUALITY, EROSION AND SEDIMENT CONTROL

4.1 Water Quality Unit

A water quality unit will be installed on the outlet sewer for 70 % TSS removal efficiency. MECP requirements for normal long-term suspended solids removal is stated as 70 percent TSS removal efficiency for 91 percent of annual flow. The OGS manhole will be installed just before the system outlets into the municipal sewer.

4.2 Erosion and Sediment Control

The erosion and sediment control measures for the site will be included in the tender documents, and will include the following:

- Silt fence is to be erected before grading begins on the property to protect downstream areas from the migration of sediment in overland flow.
- All disturbed areas will be stabilized by restoration of vegetative ground cover as soon as possible.
- Filter fabric will be placed over the drainage grates.
- Provide construction entrance features (mud mat) at the existing roadway to minimize the transport of sediment on construction vehicle tires off-site.

Additional erosion and sediment control notes will be provided in the tender documents.

5. CONCLUSION

Stormwater Management – The stormwater management strategy for the proposed development aligns with the City of Windsor and ERCA requirements. The design effectively manages runoff, maintaining a 5-year pre-development release rate while addressing flooding risks and ensuring adequate water quality control. The minimum finished floor elevation is set to mitigate flood risks from the 100-year storm event. Additionally, erosion and sediment control measures will be implemented to safeguard the site during construction and beyond. This report demonstrates that urban stress test storm event is managed by the surface storage.

Sanitary Sewer – The proposed development will connect to the existing 250 mm Ø sanitary sewer that is located in the Byng Road R.O.W. These flows are designed to integrate seamlessly with the existing infrastructure, ensuring efficient wastewater management.

Watermain – The proposed development will support domestic water supply by installing a 50 mm diameter watermain connected to the existing 200 mm Ø watermain located in Byng Road R.O.W. Existing fire hydrants are located on the northeast corner of Lappan Avenue and Byng Road.

We trust the foregoing is satisfactory and will allow for the review and approval of the stormwater, sanitary and watermain servicing design and engineering drawings for this development. If you have questions or require additional information, please contact Baird AE at your earliest convenience.

All of which is respectfully submitted.

Reviewed By:

Shurjeel Tunio, P.Eng.
Senior Engineer

Prepared By:

Melissa Reyes, B.Eng., E.I.T.
Civil Designer

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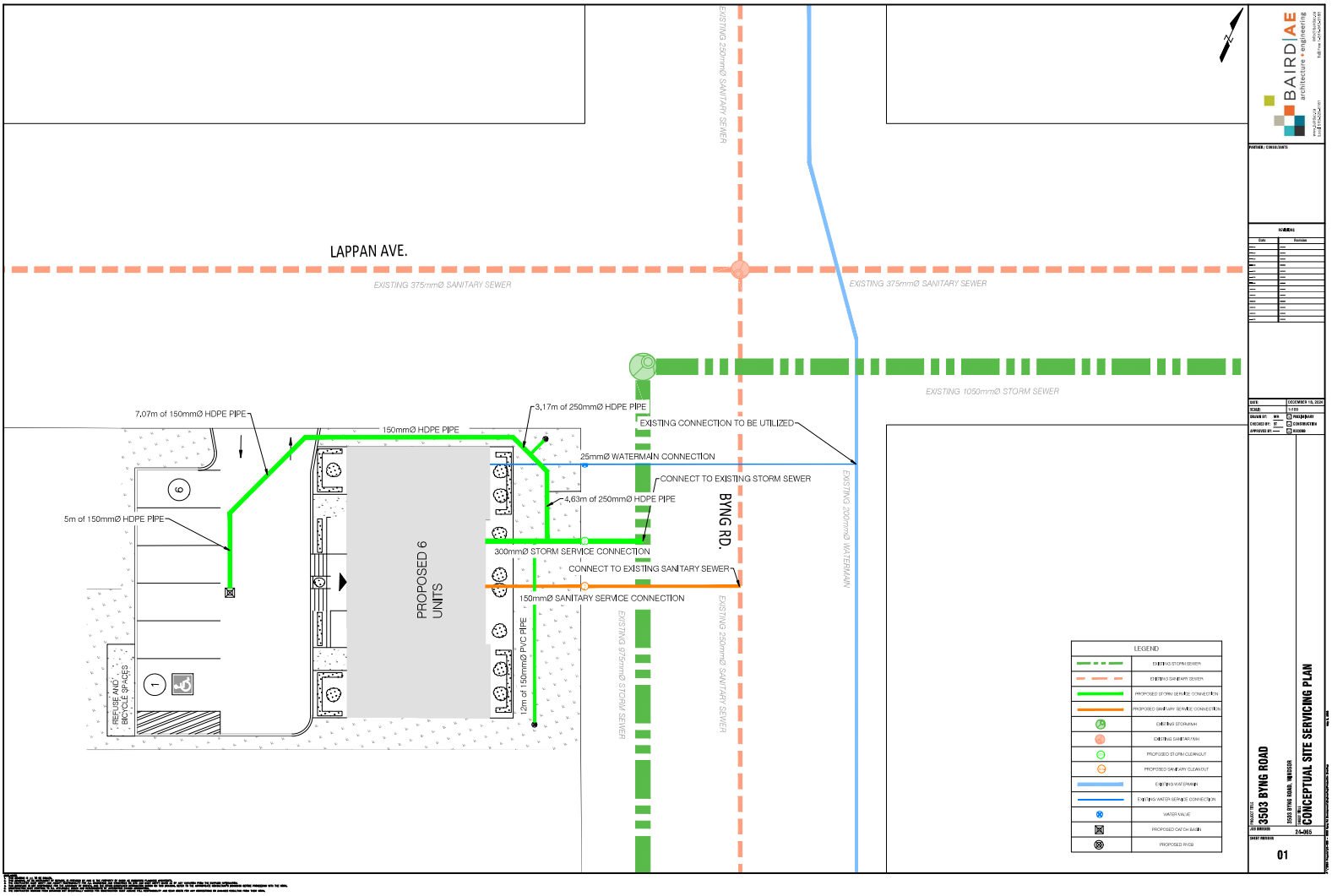
APPENDIX A: Background Information



BAIRD|AE architecture + engineering

PARTNER / CONSULTANTS

ISSUED	
Date	Revision

DATE: DECEMBER 19, 2024
SCALE: 1:150
DRAWN BY: MA — PRELIMINARY
CHECKED BY: SF — CONSTRUCTION
APPROVED BY: — ISSUED

PROJECT TITLE: 3503 BYNG ROAD
SHEET TITLE: CONCEPTUAL SITE SERVICING PLAN
JOB NUMBER: 24-365
SHEET NUMBER: 01

! Table 3.2.2.7 – Minimum C Values for Standard 5-Year Sewer Design

Land Use	C value
Asphalt, concrete, roof areas	0.95
Gravel	0.70
Grass – sandy soil	0.15
Grass – clay soil	0.20
Residential – Single family	0.60
Residential – Single family (lot size 500 m^2 or less)	0.70
Residential – Semi-detached	0.70
Residential – Townhouse / Row housing	0.80
Industrial / Commercial	0.90

Table 3.2.1.1 – IDF Curve Parameters

Parameters	Return Period (Years)					
	2	5	10	25	50	100
a	854	1259	1511	1851	2114	2375
b	7.0	8.8	9.5	10.2	10.6	11.0
c	0.818	0.838	0.845	0.852	0.858	0.861

! Table 3.7.4.1 – Typical Manning's Roughness Coefficients for Overland Flow

Surface	n
Smooth Asphalt/Concrete	0.013
Cultivated Soils - Residue Cover < 20%	0.06
Cultivated Soils - Residue Cover > 20%	0.17
Range (natural)	0.13
Grass - Short Prairie	0.15
Grass - Dense	0.24
Woods - Light Underbrush	0.40
Woods - Dense Underbrush	0.80

! Table 3.7.7.5 – Typical Horton Infiltration Parameters

Parameter	Hydrologic Group			
	A	B	C	D
fmax, dry (mm/hr)	250	200	125	75
fmax, normal (mm/hr)	250	80	50	25
fmin (mm/hr)				
clay	7.6	3.8	1.3	0.5
loam	9.5	5.7	2.5	1.0
sand	11.4	7.6	3.8	1.3
k (1/hr)	4	4	4	4

Table A-3.7.7 – Soil Types in Essex County

Texture	Symbol	Name	Acreage	Hydrologic Group
Clay Soils	Bc	Brookston Clay	250,000	D
	Toc	Toledo Clay	17,500	D
	Cc	Clyde Clay	2,500	D
	Jc	Jeddo Clay	3,500	D
	Cac	Caistor Clay	13,500	C
	Pc	Perth Clay	9,000	C
Clay Loams	Pcl	Perth Clay Loam	8,000	C
	Cacl	Caistor Clay Loam	2,500	C
	Bcl	Brookston Clay Loam	30,000	D
Silt Loam	Tos	Toledo Silt Loam	1,000	D
Loams	Bg	Burford Loam	3,700	A
	Bg-s	Burford Loam Shallow Phase	5,300	A
	Hl	Harrow Loam	4,000	A
	Fl	Farmington Loam	2,000	B
	Pl	Parkhill Loam	5,000	C
	P-r	Parkhill Loam Red Sand Spot Phase	5,000	C

5-YEAR DESIGN STORMS

CHICAGO 4-HOUR
Depth = 49.5 mm

Time h:mm	5min Rain mm/hr
0:00	2.44
0:05	2.58
0:10	2.73
0:15	2.91
0:20	3.12
0:25	3.36
0:30	3.65
0:35	3.99
0:40	4.41
0:45	4.92
0:50	5.59
0:55	6.46
1:00	7.66
1:05	9.42
1:10	12.20
1:15	17.18
1:20	28.20
1:25	64.52
1:30	139.58
1:35	60.83
1:40	35.06
1:45	23.95
1:50	17.96
1:55	14.28
2:00	11.81
2:05	10.06
2:10	8.75
2:15	7.74
2:20	6.94
2:25	6.29
2:30	5.76
2:35	5.30
2:40	4.92
2:45	4.59
2:50	4.30
2:55	4.05
3:00	3.83
3:05	3.63
3:10	3.45
3:15	3.29
3:20	3.14
3:25	3.01
3:30	2.89
3:35	2.78
3:40	2.67
3:45	2.58
3:50	2.49
3:55	2.41
4:00	0.00

Time h:mm	10min Rain mm/hr
0:00	2.51
0:10	2.82
0:20	3.24
0:30	3.82
0:40	4.67
0:50	6.02
1:00	8.54
1:10	14.69
1:20	38.85
1:30	107.72
1:40	29.51
1:50	16.12
2:00	10.93
2:10	8.25
2:20	6.62
2:30	5.53
2:40	4.76
2:50	4.18
3:00	3.73
3:10	3.37
3:20	3.08
3:30	2.83
3:40	2.63
3:50	2.45
4:00	0.00

Time h:mm	15min Rain mm/hr
0:00	2.58
0:15	3.13
0:30	4.02
0:45	5.66
1:00	9.76
1:15	26.72
1:30	88.40
1:45	18.73
2:00	10.21
2:15	6.99
2:30	5.33
2:45	4.31
3:00	3.64
3:15	3.15
3:30	2.78
3:45	2.49
4:00	0.00

Time h:mm	20min Rain mm/hr
0:00	2.66
0:20	3.53
0:40	5.34
1:00	11.61
1:20	75.35
1:40	20.75
2:00	9.59
2:20	6.07
2:40	4.47
3:00	3.55
3:20	2.95
3:40	2.54
4:00	0.00

Time h:mm	30min Rain mm/hr
0:00	2.86
0:30	4.84
1:00	13.11
1:30	58.69
2:00	8.60
2:30	4.82
3:00	3.39
3:30	2.64
4:00	0.00

100-YEAR DESIGN STORMS

CHICAGO 4-HOUR
Depth = 81.6 mm

Time h:mm	5min Rain mm/hr
0:00	3.71
0:05	3.94
0:10	4.20
0:15	4.50
0:20	4.85
0:25	5.25
0:30	5.73
0:35	6.31
0:40	7.03
0:45	7.92
0:50	9.07
0:55	10.59
1:00	12.72
1:05	15.84
1:10	20.81
1:15	29.71
1:20	49.12
1:25	108.91
1:30	218.23
1:35	103.42
1:40	60.97
1:45	41.72
1:50	31.11
1:55	24.53
2:00	20.12
2:05	16.98
2:10	14.65
2:15	12.86
2:20	11.44
2:25	10.30
2:30	9.36
2:35	8.58
2:40	7.91
2:45	7.34
2:50	6.85
2:55	6.42
3:00	6.04
3:05	5.70
3:10	5.40
3:15	5.13
3:20	4.88
3:25	4.66
3:30	4.46
3:35	4.27
3:40	4.10
3:45	3.95
3:50	3.80
3:55	3.67
4:00	0.00

Time h:mm	10min Rain mm/hr
0:00	3.83
0:10	4.35
0:20	5.05
0:30	6.02
0:40	7.47
0:50	9.83
1:00	14.28
1:10	25.26
1:20	67.16
1:30	172.68
1:40	51.34
1:50	27.82
2:00	18.55
2:10	13.75
2:20	10.87
2:30	8.97
2:40	7.63
2:50	6.63
3:00	5.87
3:10	5.26
3:20	4.77
3:30	4.37
3:40	4.03
3:50	3.74
4:00	0.00

Time h:mm	15min Rain mm/hr
0:00	3.95
0:15	4.87
0:30	6.36
0:45	9.19
1:00	16.45
1:15	46.45
1:30	143.67
1:45	32.45
2:00	17.25
2:15	11.53
2:30	8.62
2:45	6.87
3:00	5.71
3:15	4.89
3:30	4.28
3:45	3.81
4:00	0.00

Time h:mm	20min Rain mm/hr
0:00	4.09
0:20	5.54
0:40	8.65
1:00	19.77
1:20	123.48
1:40	36.02
2:00	16.15
2:20	9.92
2:40	7.13
3:00	5.56
3:20	4.57
3:40	3.88
4:00	0.00

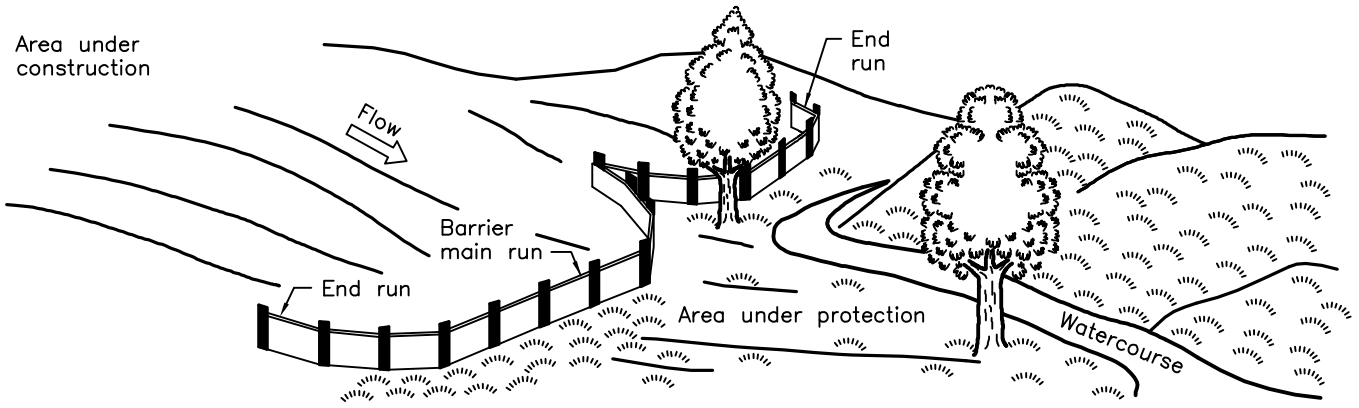
Time h:mm	30min Rain mm/hr
0:00	4.41
0:30	7.78
1:00	22.45
1:30	97.06
2:00	14.39
2:30	7.74
3:00	5.30
3:30	4.04
4:00	0.00

SCS TYPE II 24-HOUR DESIGN STORMS

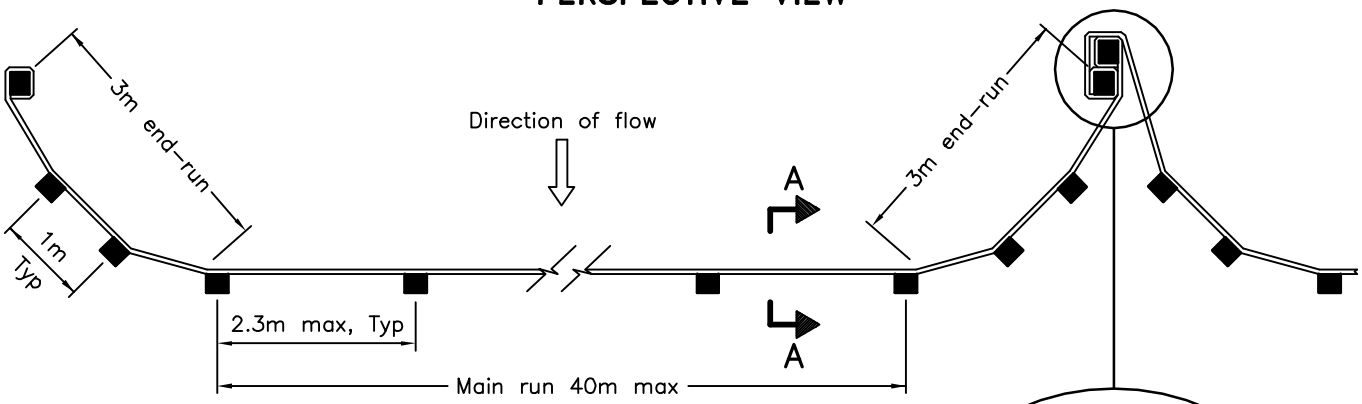
		Unit Rainfall Depth = 1 mm	100-Year Depth = 108 mm	Rural Stress Test Depth = 150 mm	5-Year Depth = 68.0 mm
Time h:mm	Rain %	2hour Rain mm/hr	2hour Rain mm/hr	2hour Rain mm/hr	2hour Rain mm/hr
0:00	0	0.000	0.00	0.00	0.00
2:00	2	0.010	1.08	1.50	0.68
4:00	3	0.015	1.62	2.25	1.02
6:00	3	0.015	1.62	2.25	1.02
8:00	4	0.020	2.16	3.00	1.36
10:00	6	0.030	3.24	4.50	2.04
12:00	48	0.240	25.92	36.00	16.32
14:00	16	0.080	8.64	12.00	5.44
16:00	4	0.030	3.24	4.50	2.04
18:00	3	0.020	2.16	3.00	1.36
20:00	3	0.015	1.62	2.25	1.02
22:00	2	0.015	1.62	2.25	1.02
0:00	0	0.010	1.08	1.50	0.68

V2 URBAN STRESS TEST STORM

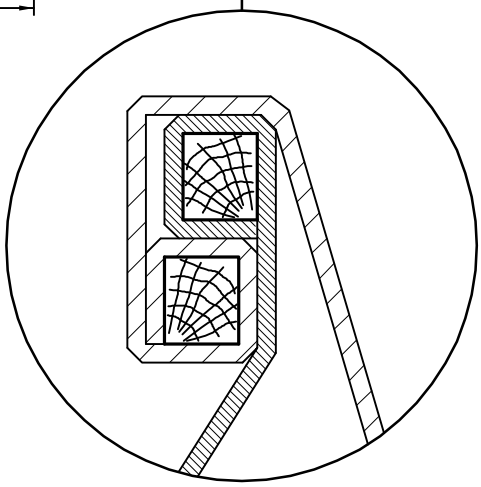
CHICAGO 100-YEAR 24-HOUR (108 mm) + UNIFORM DISTRIBUTION OF ADDITIONAL 42 mm Depth = 108 mm + 42 mm = 150 mm			
Time h:mm	**15min Rain mm/hr**	**Time h:mm**	**15min Rain mm/hr**
0:00	2.41	12:15	4.42
0:15	2.43	12:30	4.24
0:30	2.45	12:45	4.08
0:45	2.47	13:00	3.94
1:00	2.49	13:15	3.82
1:15	2.51	13:30	3.71
1:30	2.53	13:45	3.61
1:45	2.56	14:00	3.52
2:00	2.59	14:15	3.44
2:15	2.61	14:30	3.37
2:30	2.65	14:45	3.31
2:45	2.68	15:00	3.25
3:00	2.71	15:15	3.19
3:15	2.75	15:30	3.14
3:30	2.80	15:45	3.09
3:45	2.84	16:00	3.05
4:00	2.89	16:15	3.01
4:15	2.95	16:30	2.97
4:30	3.01	16:45	2.93
4:45	3.09	17:00	2.90
5:00	3.17	17:15	2.87
5:15	3.26	17:30	2.84
5:30	3.36	17:45	2.81
5:45	3.49	18:00	2.78
6:00	3.63	18:15	2.76
6:15	3.80	18:30	2.73
6:30	4.01	18:45	2.71
6:45	4.27	19:00	2.69
7:00	4.61	19:15	2.67
7:15	5.05	19:30	2.65
7:30	5.66	19:45	2.63
7:45	6.56	20:00	2.61
8:00	8.04	20:15	2.59
8:15	10.84	20:30	2.58
8:30	18.04	20:45	2.56
8:45	48.06	21:00	2.54
9:00	145.42	21:15	2.53
9:15	34.36	21:30	2.52
9:30	19.10	21:45	2.50
9:45	13.36	22:00	2.49
10:00	10.42	22:15	2.48
10:15	8.66	22:30	2.47
10:30	7.50	22:45	2.45
10:45	6.67	23:00	2.44
11:00	6.06	23:15	2.43
11:15	5.58	23:30	2.42
11:30	5.20	23:45	2.41
11:45	4.90	0:00	0.00
12:00	4.64		



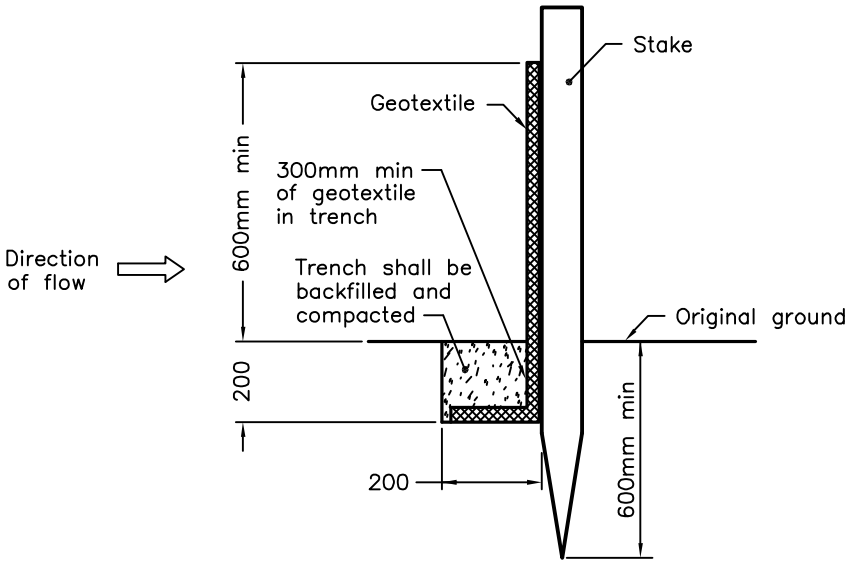
PERSPECTIVE VIEW



PLAN



JOINT DETAIL

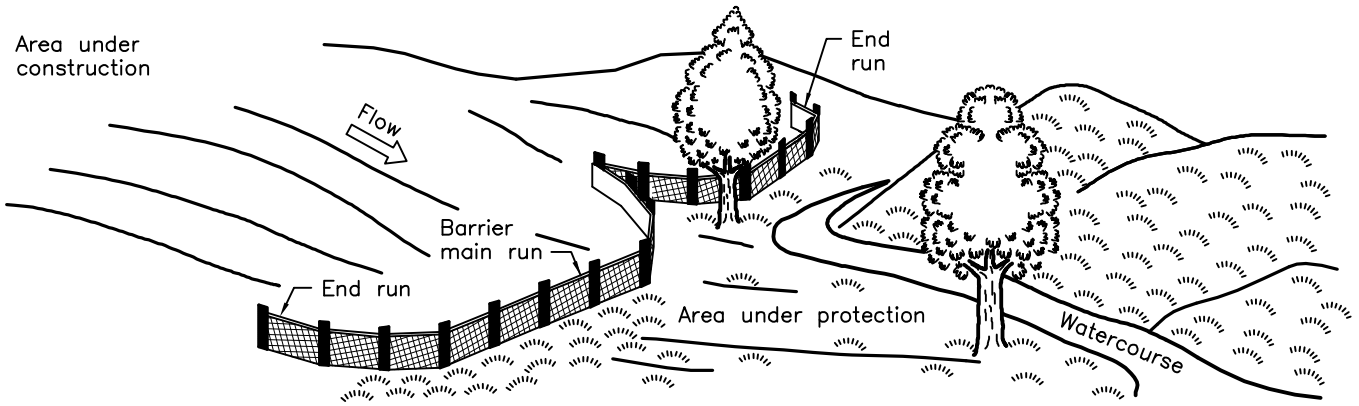


SECTION A–A

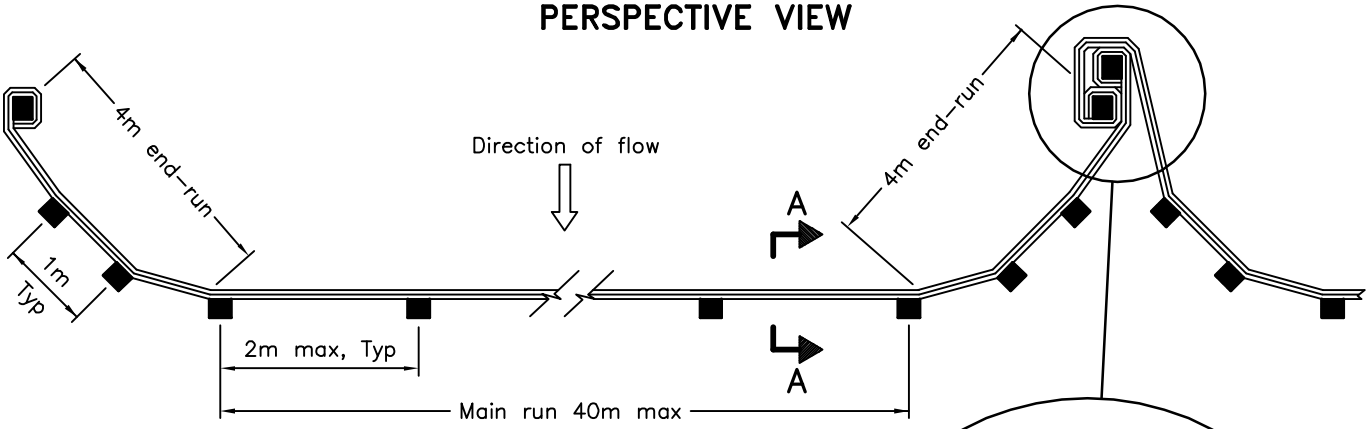
NOTE:

A All dimensions are in millimetres unless otherwise shown.

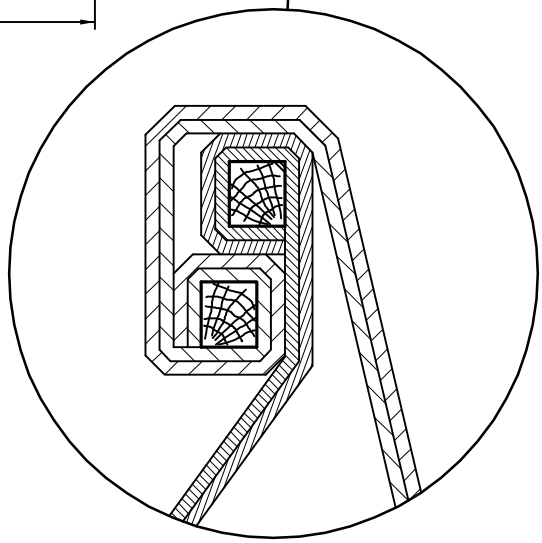
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY SILT FENCE BARRIER			
	OPSD 219.110		



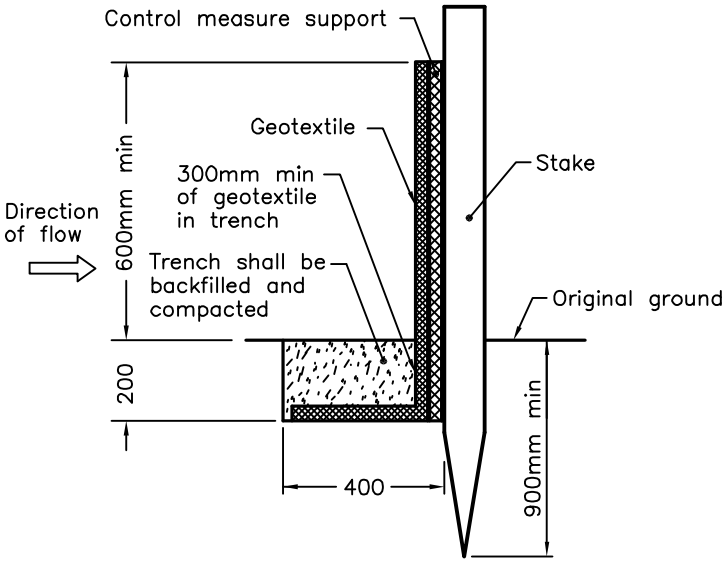
PERSPECTIVE VIEW



PLAN



JOINT DETAIL



SECTION A–A

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
HEAVY–DUTY SILT FENCE BARRIER			
	OPSD 219.130		

APPENDIX B: HYDROGRAPH Model Results – Pre-Development And Post-Development Conditions

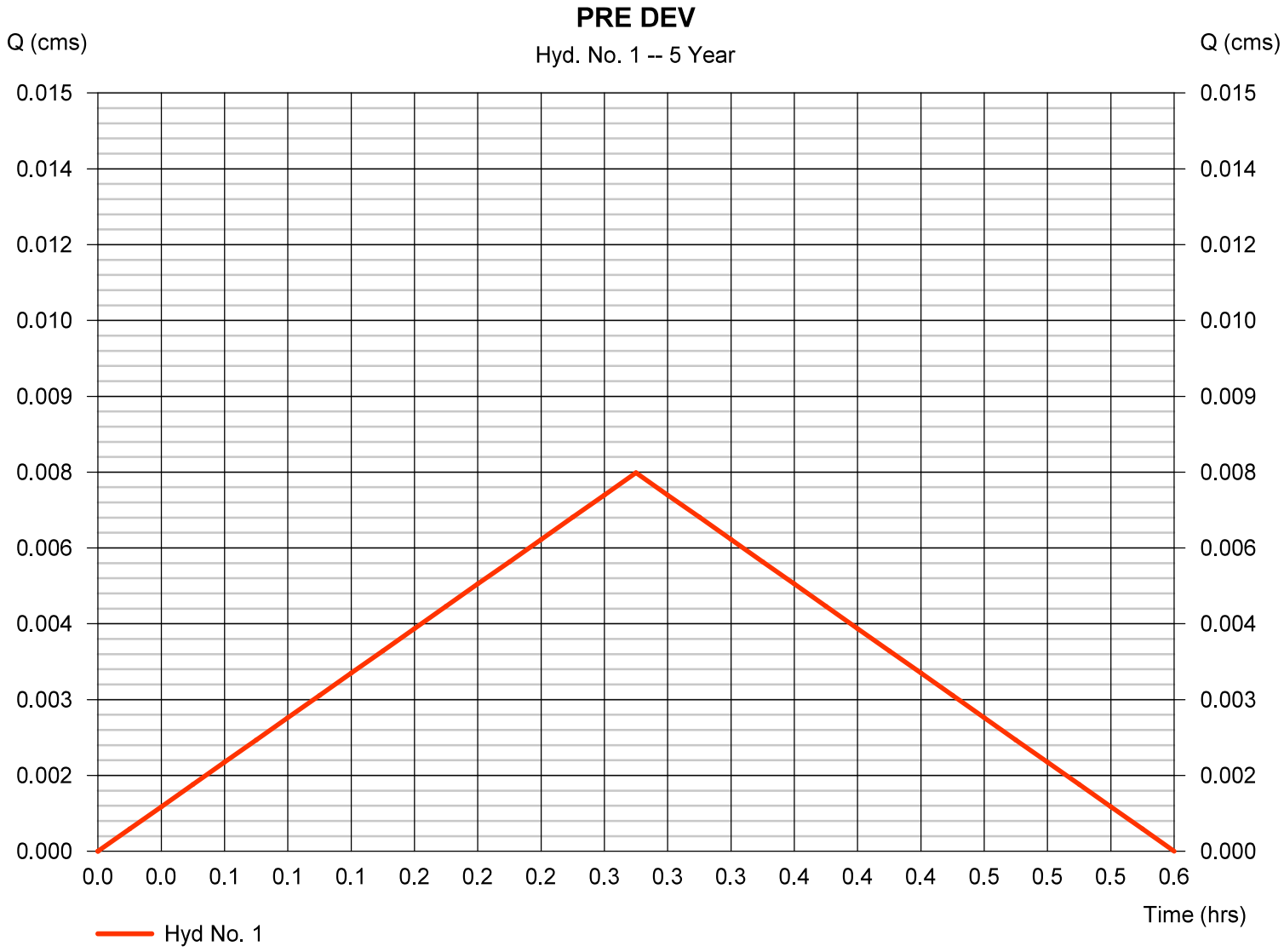
Hydrograph Report

Hyd. No. 1

PRE DEV

Hydrograph type	=	Rational	Peak discharge	=	0.007 cms
Storm frequency	=	5 yrs	Time to peak	=	0.28 hrs
Time interval	=	1 min	Hyd. volume	=	7.6 cum
Drainage area	=	0.070 hectare	Runoff coeff.	=	0.47*
Intensity	=	82.633 mm/hr	Tc by TR55	=	17.00 min
IDF Curve	=	WINDSOR A.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.025 x 0.90) + (0.041 x 0.20)] / 0.070



TR55 Tc Worksheet

Hyd. No. 1

PRE DEV

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (m)	= 32.0		0.0		0.0		
Two-year 24-hr precip. (mm)	= 53.40		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 16.58**	**+**	**0.00**	**+**	**0.00**	**=**	**16.58**
Shallow Concentrated Flow							
Flow length (m)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (m/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqm)	= 0.00		0.00		0.00		
Wetted perimeter (m)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (m/s)	=0.00						
			0.00				
					0.00		
Flow length (m)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 17.00 min

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	84.9450	17.7800	2.0745	--------
3	0.0000	0.0000	0.0000	--------
5	127.4621	22.6060	2.1355	--------
10	148.3482	23.8760	2.1354	--------
25	182.0652	25.6540	2.1545	--------
50	211.5120	26.9240	2.1797	--------
100	240.0359	28.1940	2.1925	--------

File name: WINDSOR A.IDF

Intensity = B / (Tc + D)^E

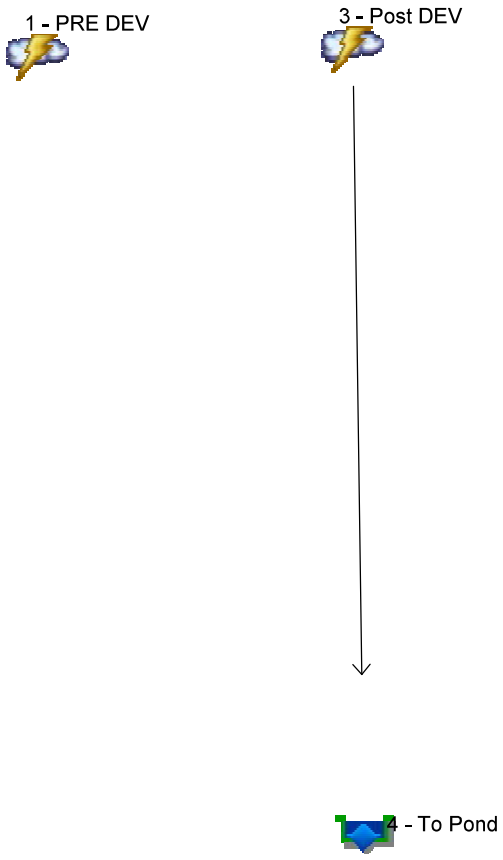
Return Period (Yrs)	Intensity Values (mm/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0	0	0	0	0	0	0	0	0	0	0	0
2	112	84	68	58	50	44	40	37	34	31	29	27
3	0	0	0	0	0	0	0	0	0	0	0	0
5	139	108	88	75	66	59	53	48	45	41	39	36
10	158	123	101	86	76	68	61	56	52	48	45	42
25	182	143	118	101	89	80	72	66	61	56	53	49
50	200	158	131	112	99	88	80	73	67	62	58	55
100	218	173	144	124	109	97	88	80	74	69	64	60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (mm)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	32	53	0	68	78	90	99	108
SCS 6-Hr	0	0	0	0	0	0	0	0
Huff-1st	0	0	0	0	0	0	0	0
Huff-2nd	0	0	0	0	0	0	0	0
Huff-3rd	0	0	0	0	0	0	0	0
Huff-4th	0	0	0	0	0	0	0	0
Huff-Indy	0	0	0	0	0	0	0	0
Custom	0	0	0	0	0	0	0	0

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	PRE DEV
3	Rational	Post DEV
4	Reservoir	To Pond

Hydraflow Table of Contents

PRE-DEV.gpw

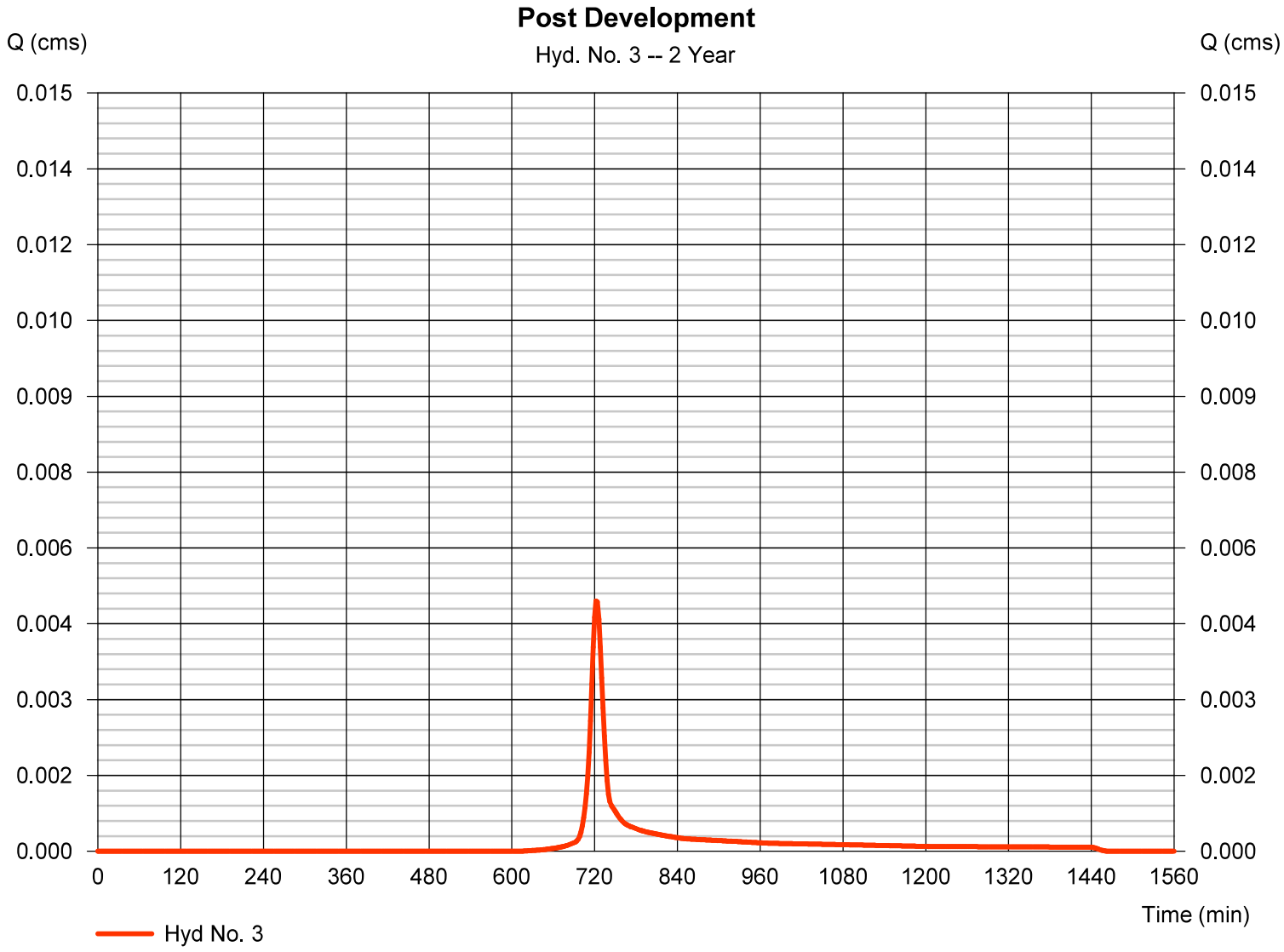
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 05 / 9 / 2025

Hydrograph Report

Hyd. No. 3

Post Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.005 cms
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	14.2 cum
Drainage area	=	0.070 hectare	Curve number	=	84
Basin Slope	=	0.5 %	Hydraulic length	=	0 m
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	53.40 mm	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



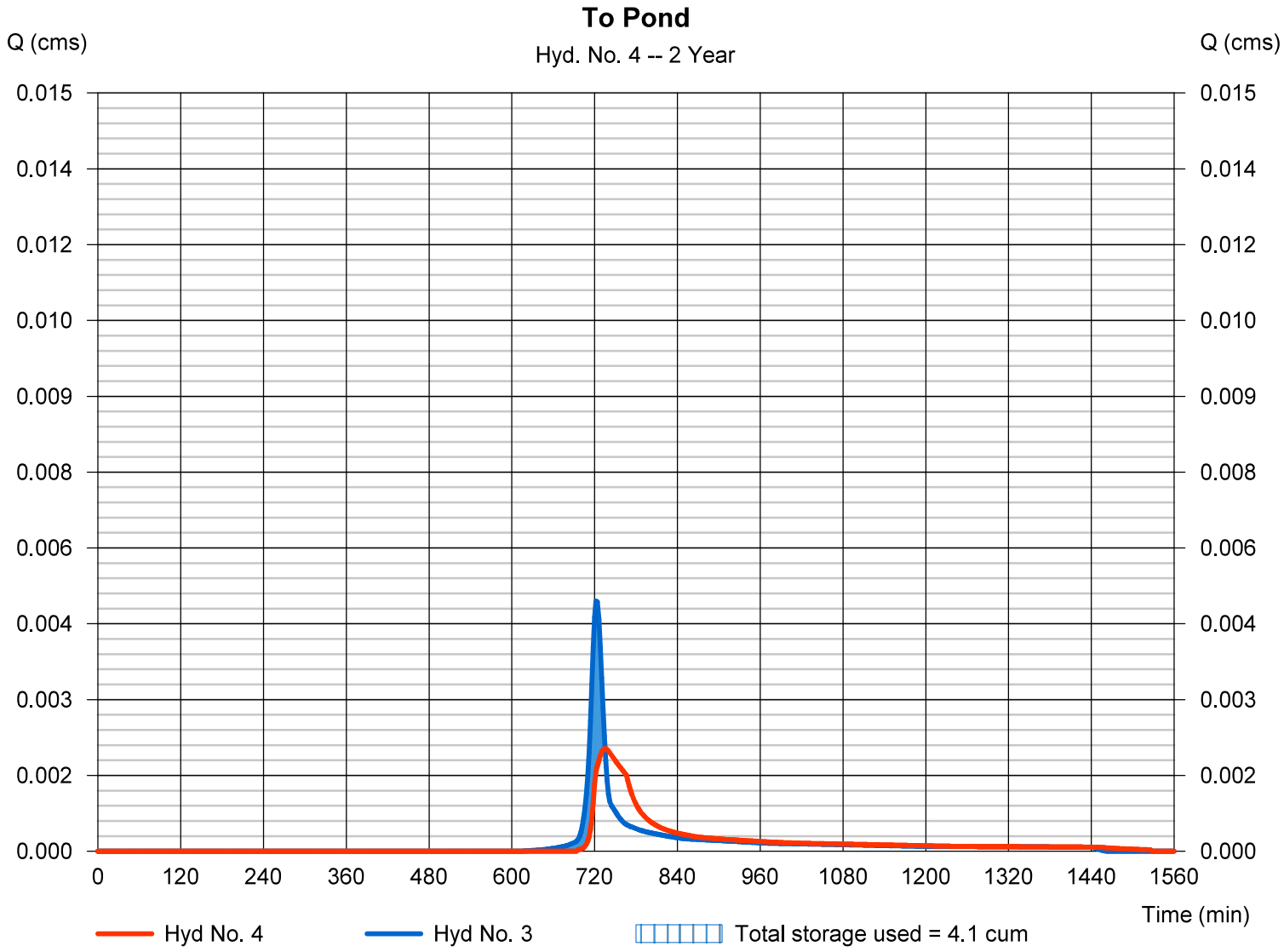
Hydrograph Report

Hyd. No. 4

To Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.002 cms
Storm frequency	=	2 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	13.9 cum
Inflow hyd. No.	=	3 - Post Development	Max. Elevation	=	184.51 m
Reservoir name	=	<New Pond>	Max. Storage	=	4.1 cum

Storage Indication method used.



Pond Report

Pond No. 1 - <New Pond>

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 184.450 m

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	184.45	04	0.0	0.0
0.05	184.50	120	2.4	2.4
0.10	184.55	240	8.8	11.2
0.15	184.60	404	15.9	27.2

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 200.00	0.00	0.00	0.00
Span (mm)	= 200.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (m)	= 184.450	0.000	0.000	0.000
Length (m)	= 5.000	0.000	0.000	0.000
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

(by Wet area)

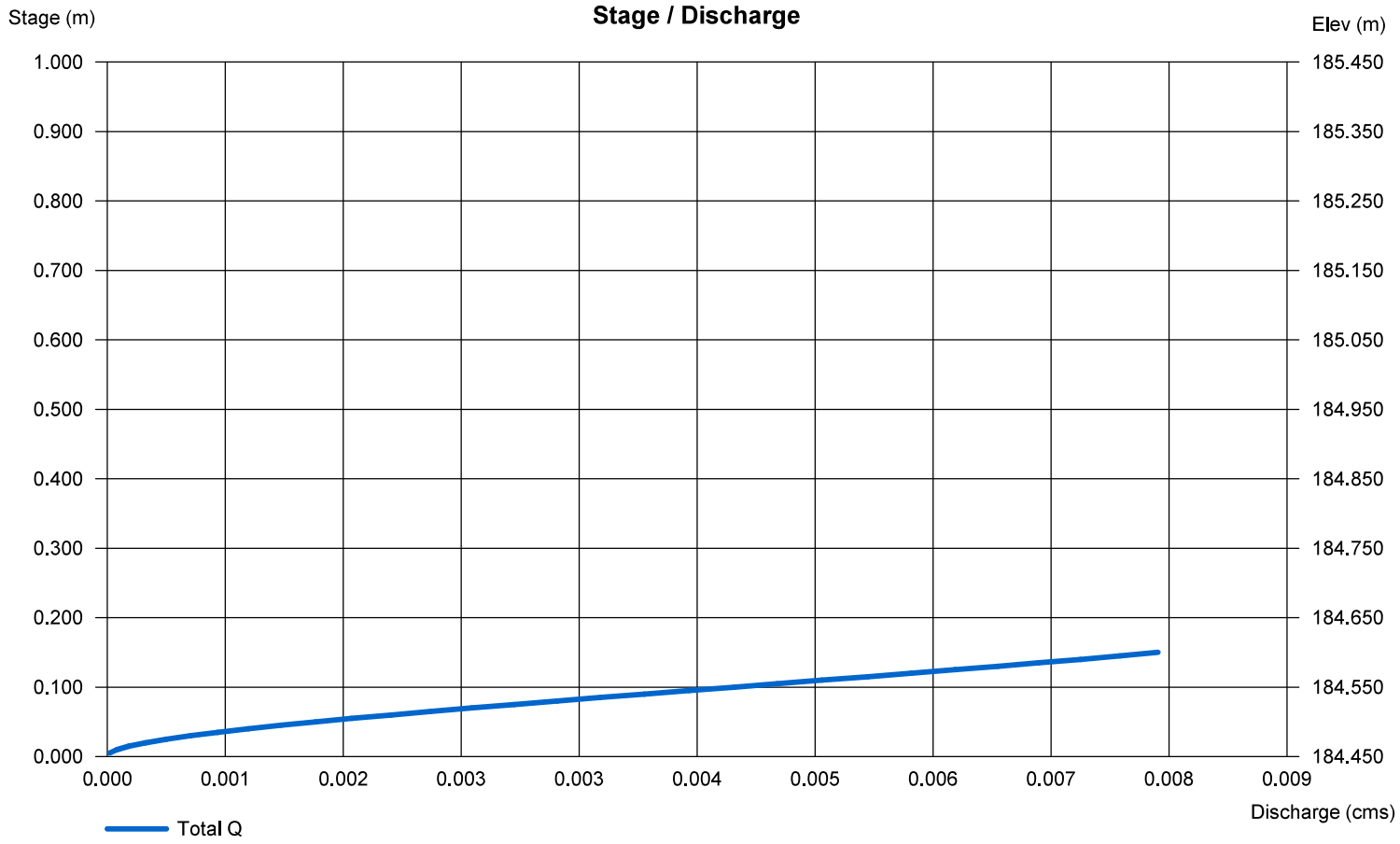
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 0.000	0.000	0.000	0.000
Crest El. (m)	= 0.000	0.000	0.000	0.000
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(cm/hr) = 0.000

TW Elev. (m) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

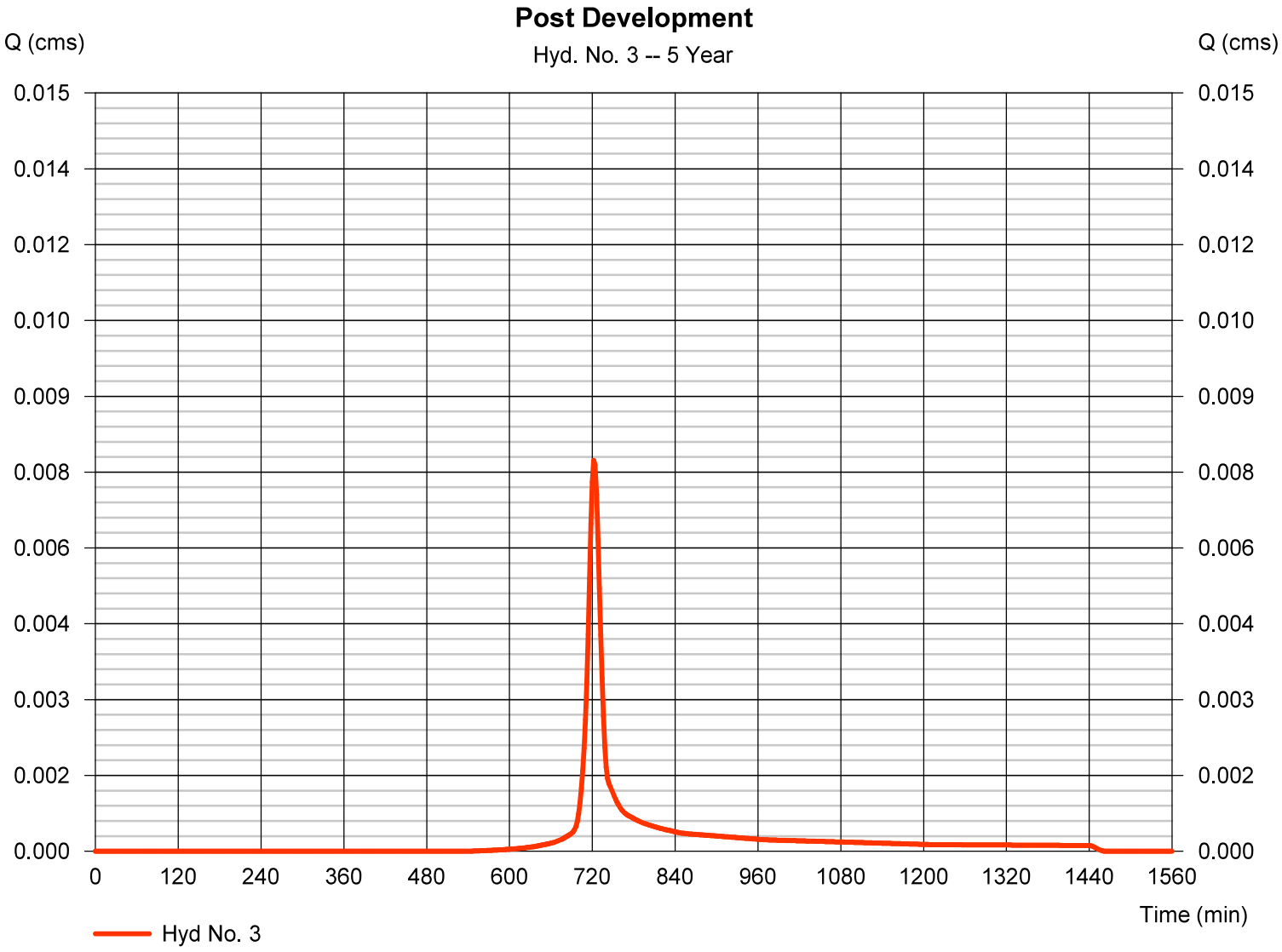


Hydrograph Report

Hyd. No. 3

Post Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.008 cms
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	21.8 cum
Drainage area	=	0.070 hectare	Curve number	=	84
Basin Slope	=	0.5 %	Hydraulic length	=	0 m
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	68.00 mm	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



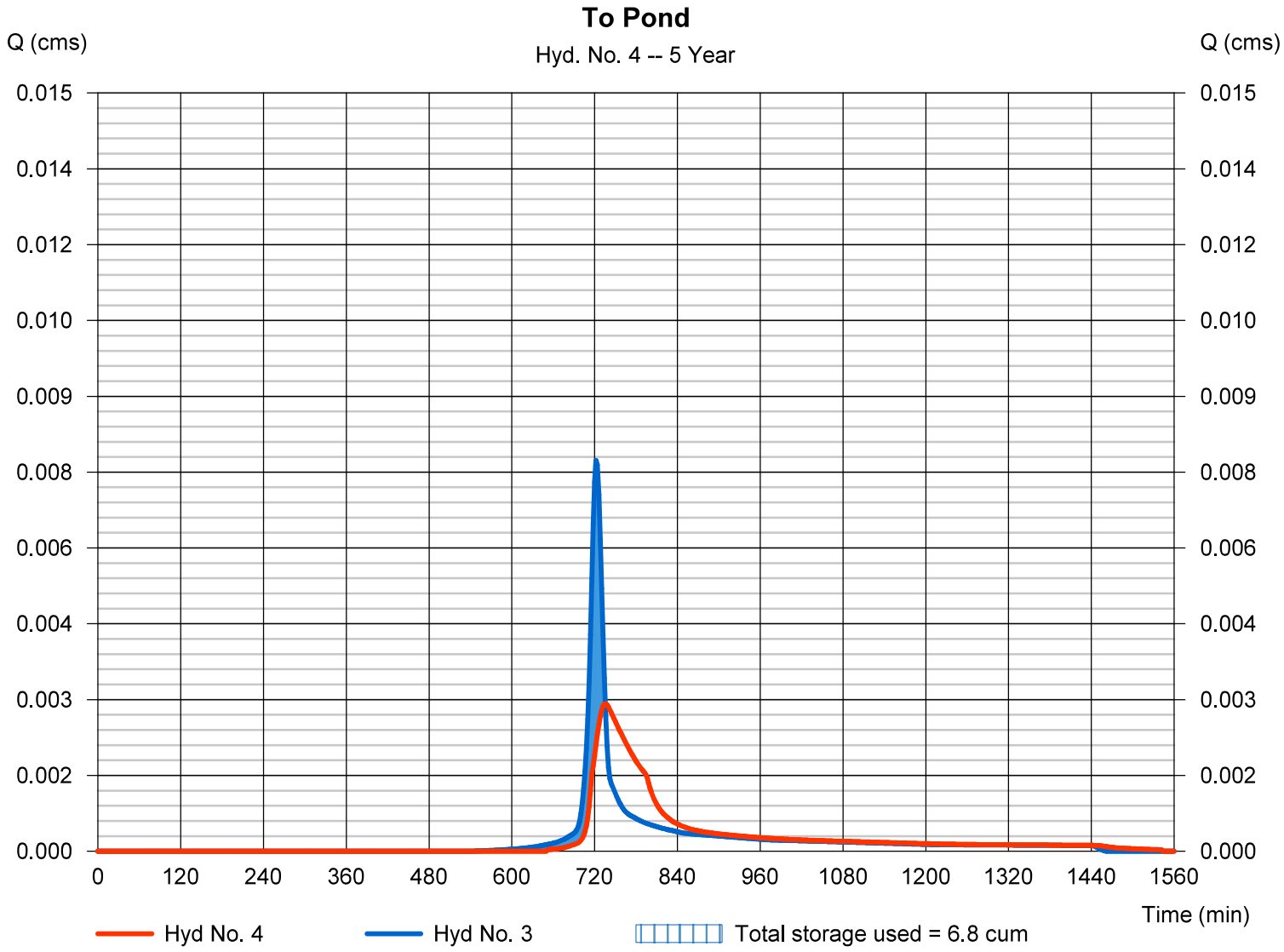
Hydrograph Report

Hyd. No. 4

To Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.003 cms
Storm frequency	=	5 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	21.5 cum
Inflow hyd. No.	=	3 - Post Development	Max. Elevation	=	184.52 m
Reservoir name	=	<New Pond>	Max. Storage	=	6.8 cum

Storage Indication method used.

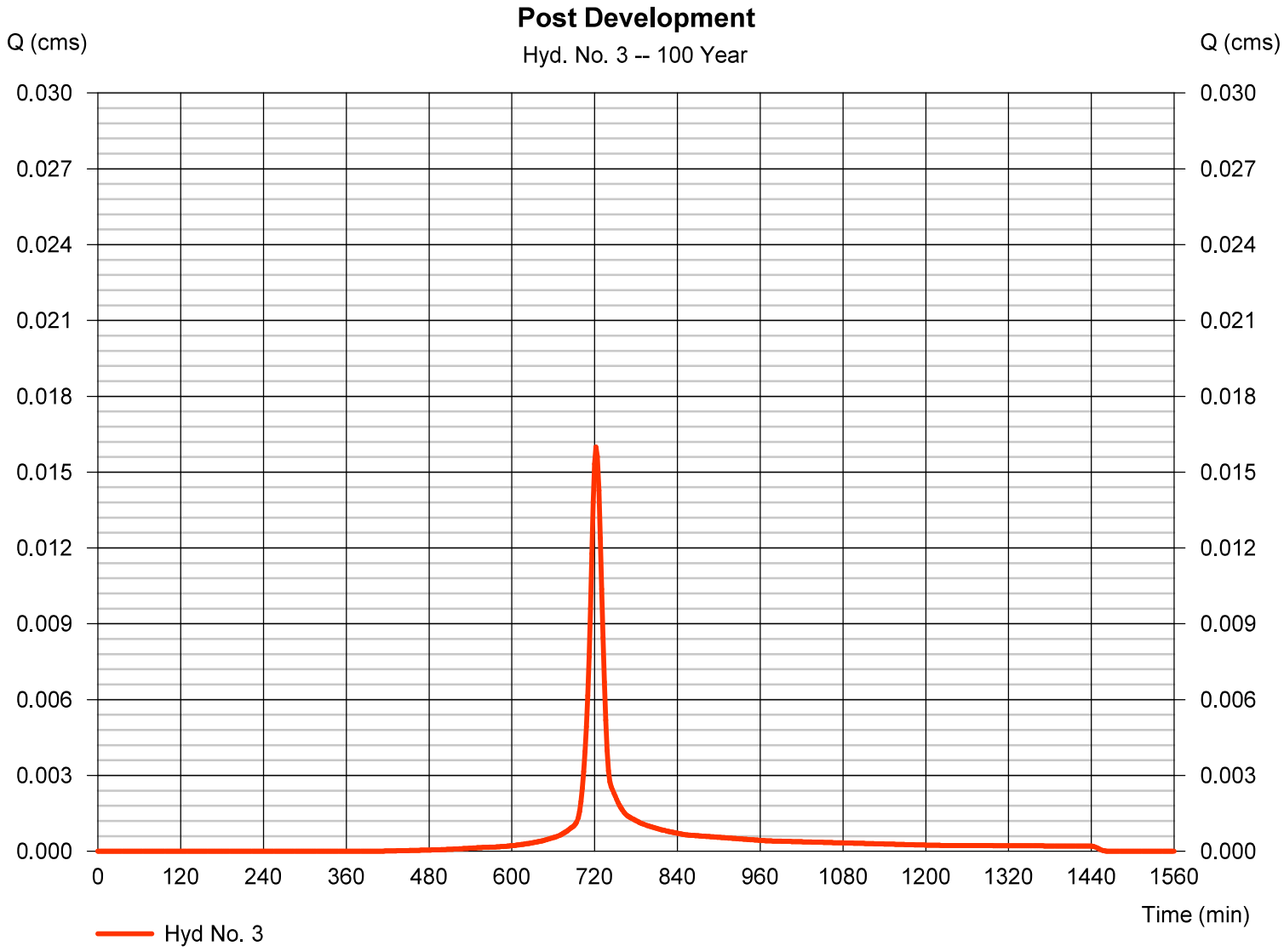


Hydrograph Report

Hyd. No. 3

Post Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.016 cms
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	45.0 cum
Drainage area	=	0.070 hectare	Curve number	=	84
Basin Slope	=	0.5 %	Hydraulic length	=	0 m
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	108.00 mm	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



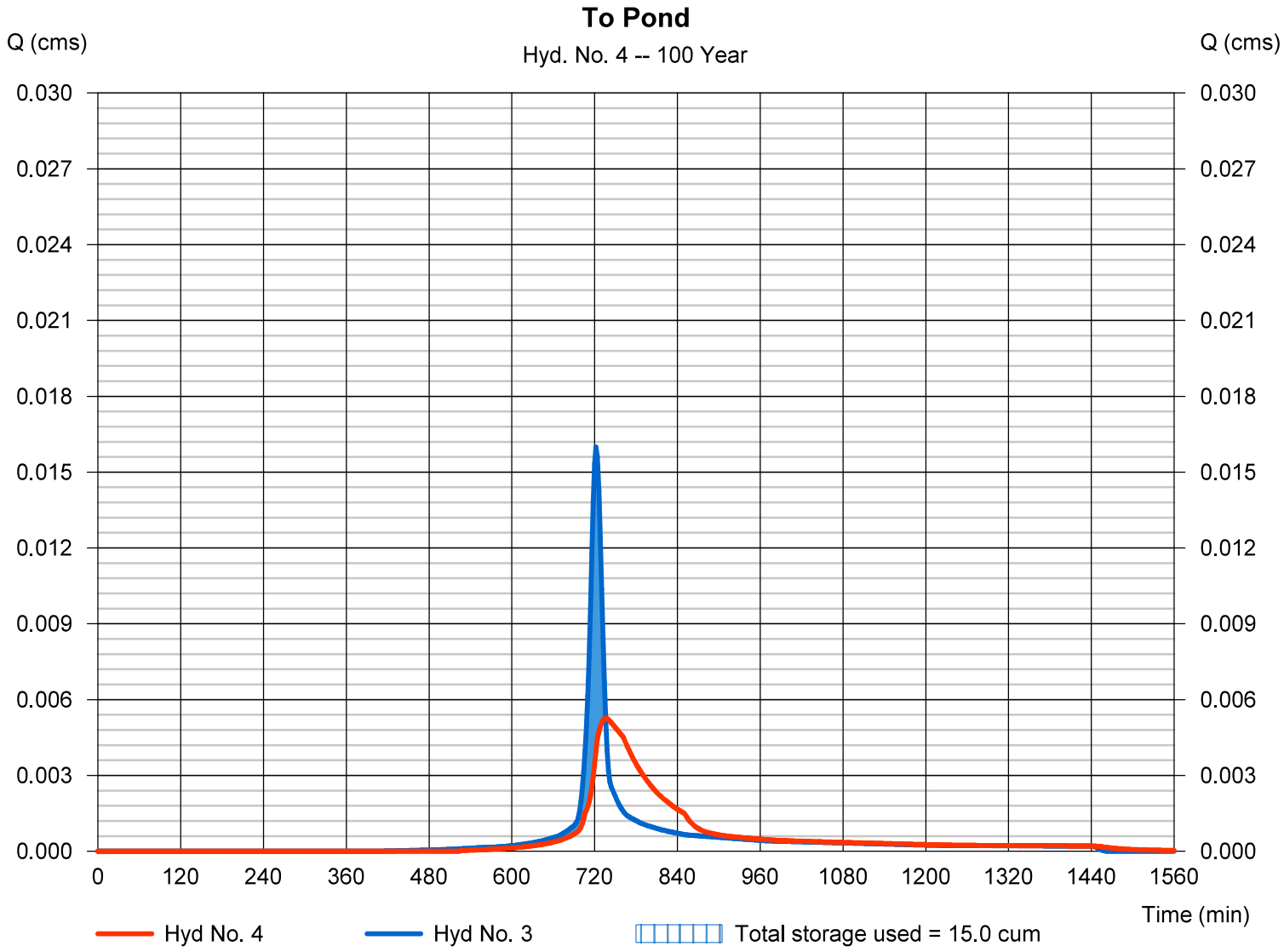
Hydrograph Report

Hyd. No. 4

To Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.005 cms
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	44.7 cum
Inflow hyd. No.	=	3 - Post Development	Max. Elevation	=	184.56 m
Reservoir name	=	<New Pond>	Max. Storage	=	15.0 cum

Storage Indication method used.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	84.9450	17.7800	2.0745	--------
3	0.0000	0.0000	0.0000	--------
5	127.4621	22.6060	2.1355	--------
10	148.3482	23.8760	2.1354	--------
25	182.0652	25.6540	2.1545	--------
50	211.5120	26.9240	2.1797	--------
100	240.0359	28.1940	2.1925	--------

File name: WINDSOR A.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (mm/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0	0	0	0	0	0	0	0	0	0	0	0
2	112	84	68	58	50	44	40	37	34	31	29	27
3	0	0	0	0	0	0	0	0	0	0	0	0
5	139	108	88	75	66	59	53	48	45	41	39	36
10	158	123	101	86	76	68	61	56	52	48	45	42
25	182	143	118	101	89	80	72	66	61	56	53	49
50	200	158	131	112	99	88	80	73	67	62	58	55
100	218	173	144	124	109	97	88	80	74	69	64	60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (mm)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	32	53	0	68	78	90	99	108
SCS 6-Hr	0	0	0	0	0	0	0	0
Huff-1st	0	0	0	0	0	0	0	0
Huff-2nd	0	0	0	0	0	0	0	0
Huff-3rd	0	0	0	0	0	0	0	0
Huff-4th	0	0	0	0	0	0	0	0
Huff-Indy	0	0	0	0	0	0	0	0
Custom	0	0	0	0	0	0	0	0

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

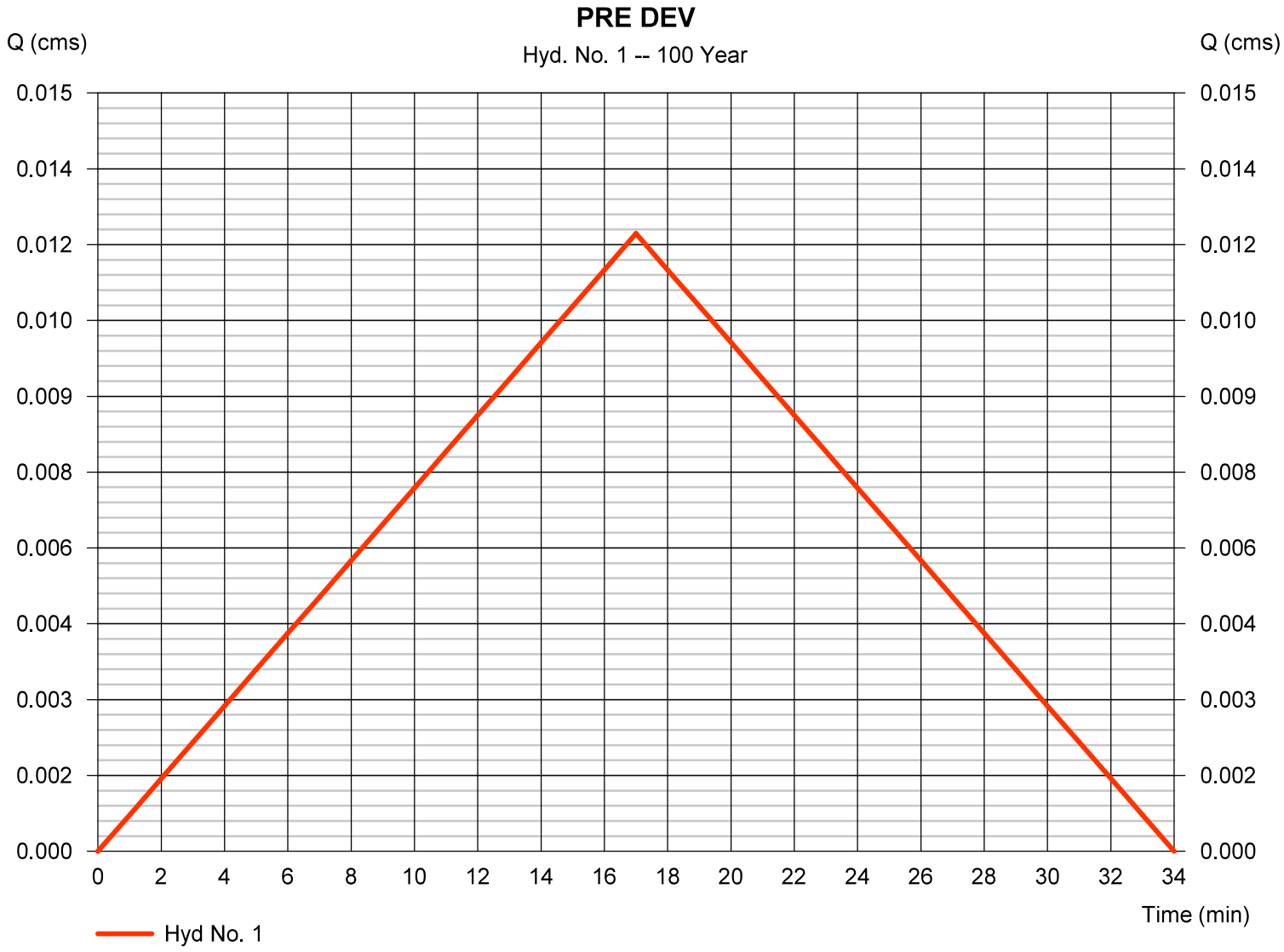
Friday, 05 / 9 / 2025

Hyd. No. 1

PRE DEV

Hydrograph type	=	Rational	Peak discharge	=	0.012 cms
Storm frequency	=	100 yrs	Time to peak	=	17 min
Time interval	=	1 min	Hyd. volume	=	12.5 cum
Drainage area	=	0.070 hectare	Runoff coeff.	=	0.47*
Intensity	=	134.823 mm/hr	Tc by TR55	=	17.00 min
IDF Curve	=	WINDSOR A.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(0.025 x 0.90) + (0.041 x 0.20)] / 0.070



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 1

PRE DEV

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (m)	= 32.0		0.0		0.0		
Two-year 24-hr precip. (mm)	= 53.40		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 16.58**	**+**	**0.00**	**+**	**0.00**	**=**	**16.58**
Shallow Concentrated Flow							
Flow length (m)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (m/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqm)	= 0.00		0.00		0.00		
Wetted perimeter (m)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (m/s)	=0.00						
			0.00				
					0.00		
Flow length (m)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

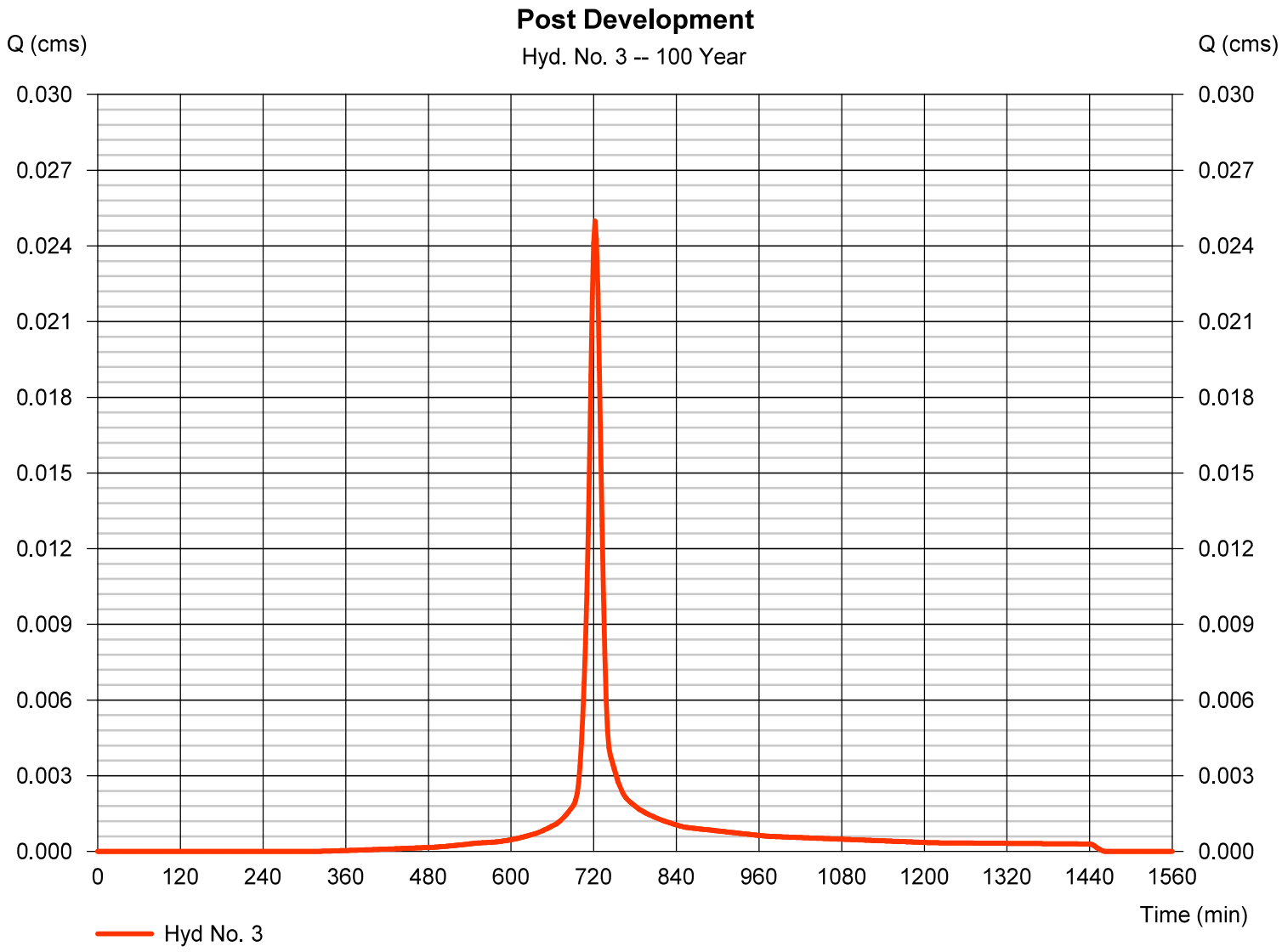
Total Travel Time, Tc ..... 17.00 min

Hydrograph Report

Hyd. No. 3

Post Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.025 cms
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	71.2 cum
Drainage area	=	0.070 hectare	Curve number	=	84
Basin Slope	=	0.5 %	Hydraulic length	=	0 m
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	150.00 mm	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

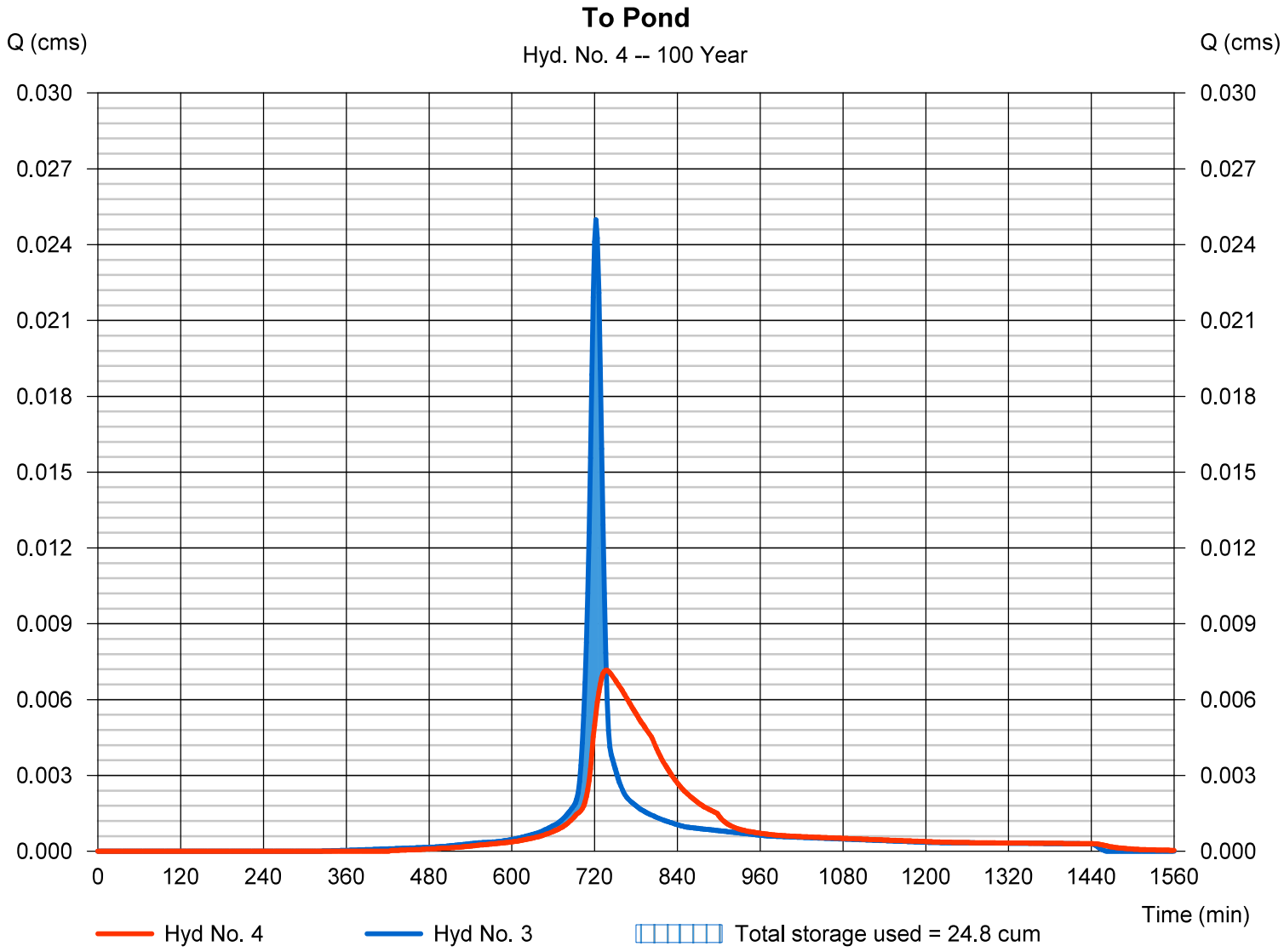
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 05 / 9 / 2025

Hyd. No. 4

To Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.007 cms
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	70.9 cum
Inflow hyd. No.	=	3 - Post Development	Max. Elevation	=	184.59 m
Reservoir name	=	<New Pond>	Max. Storage	=	24.8 cum

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 05 / 9 / 2025

Pond No. 1 - <New Pond>

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 184.450 m

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	184.45	04	0.0	0.0
0.05	184.50	120	2.4	2.4
0.10	184.55	240	8.8	11.2
0.15	184.60	404	15.9	27.2

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 200.00	0.00	0.00	0.00
Span (mm)	= 200.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (m)	= 184.450	0.000	0.000	0.000
Length (m)	= 5.000	0.000	0.000	0.000
Slope (%)	= 0.20	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

(by Wet area)

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 0.000	0.000	0.000	0.000
Crest El. (m)	= 0.000	0.000	0.000	0.000
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(cm/hr) = 0.000

TW Elev. (m) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).